CLAIMS

1. A poly(trimethylene terephthalate) comprising 80% by weight or more of trimethylene terephthalate units based on the entire repeating units, and satisfying the following conditions (1) and (2):

(1) the intrinsic viscosity is from 0.4 to 1.5 dl/g; and

(2) $[-OH]/([-OH] + [-COOH] + [-CH_2CH=CH_2]) \times 100 \geqq 40$

wherein [-OH], [-COOH] and $[-CH_2CH=CH_2]$ represent a terminal hydroxyl group content, a terminal carboxyl group content and a terminal allyl group content of the poly(trimethylene terephthalate), respectively.

2. The poly(trimethylene terephthalate) according to claim 1, wherein the poly(trimethylene terephthalate) further satisfies the following condition (3):

(3) the L* value is 80 or more, and the b* value is from -1 to 5.

3. The poly(trimethylene terephthalate) according any one of claim 1 or 2, wherein the poly(trimethylene terephthalate) further satisfies the following condition (4):

(4) bis(3-hydroxypropyl) ether is copolymerized in an amount of 2% by weight or less.

4. The poly(trimethylene terephthalate) according to any one of claim 1 or 2, wherein the value of $[-OH]/([-OH] + [-COOH] + [-CH_2CH=CH_2]) \times 100$ is 50 or more.

5. A process for producing a poly(trimethylene terephthalate) wherein terephthalic acid or/and its lower alcohol ester is reacted with 1,3-propanediol to form 1,3-propanediol ester of terephthalic acid and/or its oligomer, and polycondensation reaction of the reactant is conducted to give a poly(trimethylene terephthalate) containing 80% by weight or more of trimethylene terephthalate units based on the entire repeating units, the process comprising conducting the polycondensation reaction while the formula (1) is being satisfied:

$[-OH]/([-OH] + [-COOH] + [-CH_2CH=CH_2]) \times 100 \geq 40$ (1)

wherein [-OH], [-COOH] and $[-CH_2CH=CH_2]$ represent a terminal hydroxyl group content, a terminal carboxyl group content and a terminal allyl group content of the poly(trimethylene terephthalate), respectively.

6. The process for producing a poly(trimethylene terephthalate) according to claim 5, wherein the polycondensation reaction is conducted at temperature of from 235 to 270°C while the formula (1) is being satisfied

$[-OH]/([-OH] + [-COOH] + [-CH_2CH=CH_2]) \times 100 \geq 40$ (1)

wherein [-OH], [-COOH] and $[-CH_2CH=CH_2]$ represent a terminal hydroxyl group content, a terminal carboxyl group content and a terminal allyl group content of the poly(trimethylene terephthalate), respectively, and the polycondensation reaction is further conducted while the formula (2) is being satisfied when the intrinsic viscosity of the reactant is 0.5 dl/g or more

$S/V \geq 0.07$ (2)

wherein S is a total surface area (cm^2) of the polycondensation reactant, and V is a weight (g) thereof.

7. A process for producing a poly(trimethylene terephthalate), comprising solidifying once the poly(trimethylene terephthalate) obtained by the process according to any one of claim 5 or 6, and heating the poly(trimethylene terephthalate) in a solid phase, whereby the intrinsic viscosity is increased by 0.1 dl/g or more in comparison with that of the poly(trimethylene terephthalate) at the time when the polycondensation reaction is finished.

8. The process for producing a poly(trimethylene terephthalate) according to any one of claims 5 to 7, wherein the value of $[-OH]/([-OH] + [-COOH] + [-CH_2CH=CH_2]) \times 100$ in (1) is 50 or more.

9. The process for producing a poly(trimethylene terephthalate) according claim any one of claims 6 to 7,

wherein the S/V ratio is 0.15 cm^2/g or more.

10. A process for continuously producing a poly(trimethylene terephthalate) containing 80% by weight or more of trimethylene terephthalate units based on the entire repeating units, at least comprising the following steps (1) to (4):

(1) preparing a polymerization apparatus in which one or more reaction vessels (A) for conducting an ester interchange reaction or/and an esterification reaction and two or more polycondensation reaction vessels are successively connected;

(2) continuously feeding terephthalic acid or/and its lower alcohol ester and 1,3-propanediol to the reaction vessels (A), whereby 1,3-propanediol ester of terephthalic acid and/or its oligomer is continuously formed;

(3) continuously feeding the reactants formed in the step (2) to the polycondensation reaction vessels, whereby a polycondensation reaction is conducted while the polymerization degree is being increased when the reactants are successively passed through the two or more polycondensation reaction vessels; and

(4) conducting the polycondensation reaction while the formula (1) is being satisfied

$$[-OH]/([-OH] + [-COOH] + [-CH_2CH=CH_2]) \times 100 \geq 40 \quad (1)$$

wherein [-OH], [-COOH] and $[-CH_2CH=CH_2]$ represent a terminal hydroxyl group content, a terminal carboxyl group content and a terminal allyl group content of the poly(trimethylene terephthalate), respectively.

11. The process for continuously producing a poly(trimethylene terephthalate) according to claim 10, wherein the polycondensation reaction in the final polycondensation reaction vessel is conducted at temperature of from 235 to 270°C, and the polycondensation reaction is further conducted while the formula (2) is being satisfied when the intrinsic viscosity of the reactant is 0.5 dl/g or more

$$S/V \geqq 0.07 \qquad (2)$$

wherein S is a total surface area (cm^2) of the polycondensation reactant, and V is a weight (g) thereof.

12. A process for producing a poly(trimethylene terephthalate), comprising solidifying once the poly(trimethylene terephthalate) obtained by the process according to claim 10 or 11, and continuously or noncontinuously heating the poly(trimethylene terephthalate) in a solid phase, whereby the intrinsic viscosity is increased by 0.1 dl/g or more in comparison with that of the poly(trimethylene terephthalate) at the time when the polycondensation reaction is finished.

13. A fiber, a resin product or a film characterized in that the fiber, resin product or film is formed from the poly(trimethylene terephthalate) according to any one of claims 1 to 4.

14. A fiber, a resin product or a film characterized in that the fiber, resin product or film is formed from the poly(trimethylene terephthalate) obtained by the process according to any one of claims 5 to 12.